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AMMUNITION AND PROPELLANT CHARGE THEREFOR

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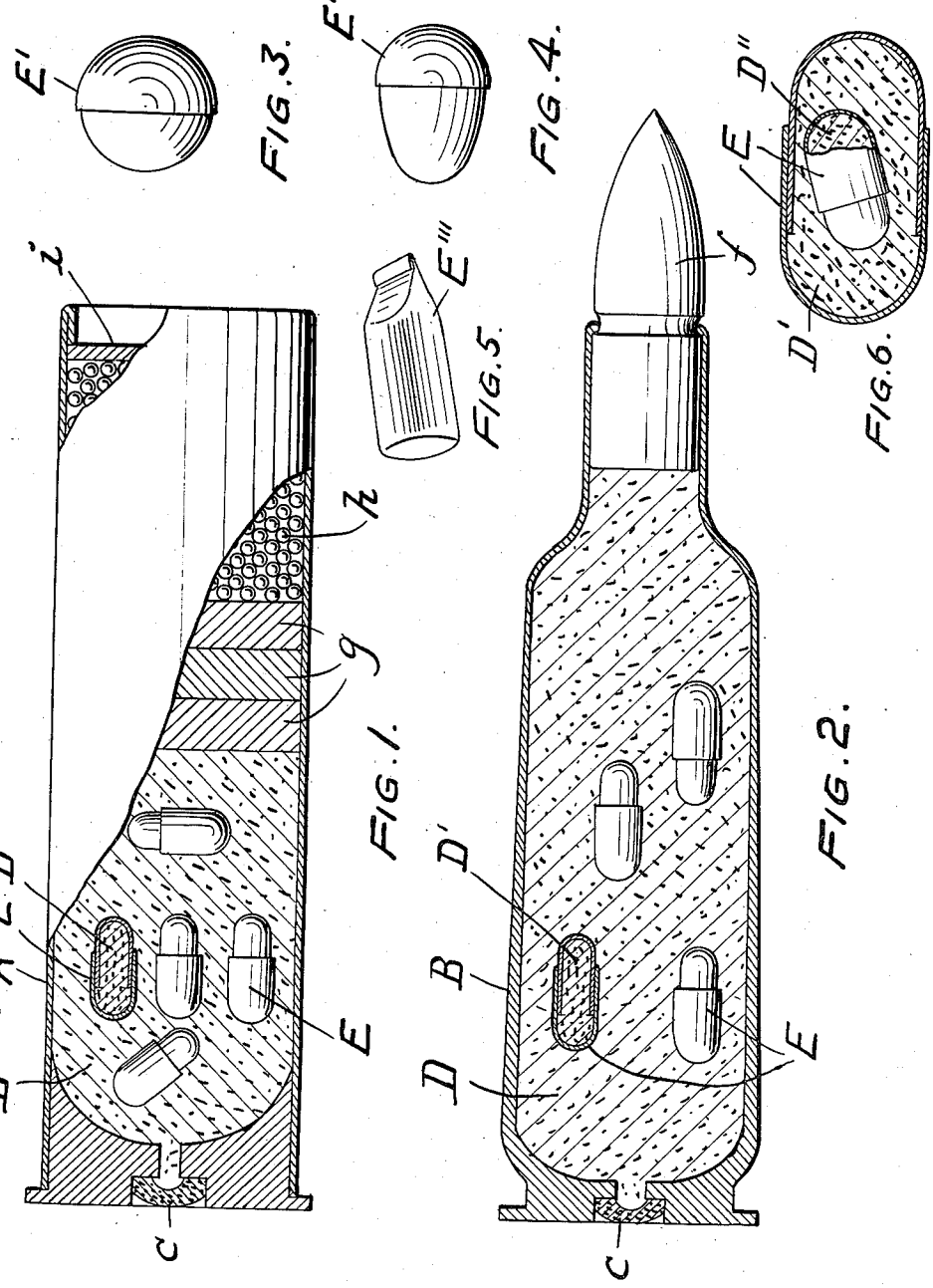

FIG. 3. FIG. 4. FIG. 5. FIG. 6. FIG. 1. FIG. 2.

WITNESS:

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AMMUNITION AND PROPELLANT CHARGE THEREFOR

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This invention relates to an improvement in ammunition and propellant charge therefor. More particularly, this invention relates to fixed ammunition and propellant charge therefor, but will be found to be applicable to non-fixed propellant charges for large calibre guns.

As is well known, a characteristic desired for propellant charges, usually composed of black or smokeless powder, is that they burn progressively so that pressure will be developed gradually and maintained or increased behind the shot or projectile after it starts its travel through a gun barrel in order that maximum velocity may be imparted to the shot or projectile with the maximum pressure developed after the shot or projectile has progressed appreciably through the gun barrel, rather than having the maximum pressure attained when the slot or projectile is at, or near, the breech of the gun. Various expedients have heretofore been used to such end. Thus, for example, the powder grains comprising a propellant charge have been coated with a deterrent material which slows the initial burning rate of powder. Again, charges have comprised a mixture of powder grains having a fast burning rate and grains having a slow burning rate, or composite powder grains having a core of fast burning nitrocellulose colloid surrounded by an outer skin of slow burning nitrocellulose colloid. Another means to the end desired has been to break up a given charge into a plurality of separate charges by division of a cartridge case into separate compartments. None of such expedients have, however, given entire satisfaction.

Now in accordance with this invention, a propellant charge is provided which has the characteristic of maintaining or building up the diminishing pressure behind the shot or a projectile, after it has progressed on its passage through a gun barrel, with the result that heavier charges may be used when desired without development of excessive maximum pressures and greatly increased projectile velocities are obtained over those obtained heretofore with similar maximum pressures.

In general, propellant charges in accordance with this invention may comprise any desired or suitable propellant powder in any desired or suitable grain form for the type and size of gun in which they are to be used. The charges may be composed of but one type of powder or of different types and all or a portion of the total charge may be treated or coated with a deterrent.

Generally speaking, propellant charges in accordance with this invention may be contained in a cartridge case or shot shell such as are usual in the case of so-called fixed ammunition, or they may be contained in powder bags such as are used in making up charges for guns of large calibre.

From the broad standpoint, propellant charges in accordance with this invention will comprise a mass of propellant powder less than the amount of the total charge and a container or capsule or a plurality of containers or capsules carrying propellant powder in amount to make up the total charge. The container or containers will be associated with the mass of powder, preferably embedded within the mass, and will be independent of the cartridge case, shot shell or powder bag in which the charge as a whole is contained. The mass of propellant powder will desirably be in the form of grains and the container or containers will desirably be, as it were, mixed with the grains forming the mass.

The container or containers may variously be formed of any desired material and may have any desired shape and structure. Thus, for example, the containers may be formed from celluloid, gelatin, tin, lead, magnesium, steel, alloy steel, etc.; and may be generally cylindrical, or of globular or ovoid or other shape. Different containers in a charge may be composed of the same or different materials and may be of the same or different shape or structure. The walls of the containers may be of varying thickness depending upon the material of which they are composed and the time for which they are desired to hold or resist burning of the powder contained therein. Different containers in a charge may have the same or different wall thickness.

The particular material or materials, shape, structure and wall thickness of the containers will depend upon conditions such as type and calibre of gun, nature of the propellant powder or powders used, number of containers in a charge, results to be attained, etc. and may be widely varied.

Having now indicated in a general way the nature and purpose of this invention I will proceed to a detailed description of a preferred embodiment thereof with reference to the accompanying drawing, in which:

Figure 1 is a view in elevation, partly in section and partly broken away, of a shot gun shell embodying this invention.

Figure 2 is a sectional view of a rifle cartridge embodying this invention.

Figures 3, 4 and 5 are views, in elevation, of different forms of containers illustrating modifications from the form of the containers shown in Figures 1 and 2.

Figure 6 is a view partly in section of a detail of a modification of this invention.

In the drawing, Figures 1 and 2, A and B indicate respectively a shot gun shell and a rifle cartridge, each provided in its base with a percussion cap *c* of any usual type.

The shell A and cartridge B each contain a propellant charge comprising a mass D of smokeless powder, of any type and form, as granular, desired or generally used in shells and cartridges, within which are embedded a plurality of containers in the form of capsules E. The capsules E may be formed of any desired or one of the indicated materials and desirably are made in two parts adapted to telescope together, as shown. The containers may have the generally cylindrical form of the capsules shown in Figures 1 and 2, or they may be of the globular form of the capsule E', Figure 3, the ovoid form of the capsule E'', Figure 4, or other desired form. Likewise the containers may be of the structure of the container E'' shown in Figure 5; or may comprise a capsule or container E within a capsule or container E as shown in Figure 6. In a structure shown in Figure 6 the capsules may be loaded with the same or different powder or explosive as indicated by D' and D''. The capsules are so constructed as to close tightly.

The mass of powder D is in amount less than the desired total charge of powder for the shell A and the cartridge B respectively. The powder necessary to supplement the mass D to make up the total desired charge is carried, as shown at D', in the tightly closed capsules E, which, depending upon conditions, type or types of powder, results desired, etc., may be greater or less in number than shown.

The cartridge B is fitted with a bullet *f*, while the shell A is provided with wads *g* over the powder, a charge of shot *h* and a shot wad *i* on which the edge of the shell is crimped to retain it.

The mass of powder D may be of any type, as black powder or smokeless powder, and may be of any form or grain size, untreated or treated with a deterrent. The powder D and the powder D' in the capsules may be of the same type and form or the two may be different in type or form, either or both. Thus the powder D may be, for example, a smokeless powder treated with a deterrent to slow the burning rate and the powder D' may be the same, or it may be, for example, an untreated faster burning powder. Again, a fast burning powder may comprise the loose charge D, and one or more capsules E may contain a slower burning powder. In certain types of arms, such loading I have found very advantageous. Obviously different types or grades of powder may be used in the capsules respectively. Again, if desired, the capsules or some of them may contain a very rapid burning explosive as nitrolactose, tetranitropentaerythrite, etc., which I contemplate as within the term "powder" as used herein.

In practice when, for example, the shell A or the cartridge B is fired in a gun, the mass of powder D will be ignited and will burn, creating a moderate pressure and temperature in the breech of the gun which will act to start the shot *h* or the bullet *f* through the gun barrel at a moderate but increasing velocity.

Some time after ignition of the powder D, depending upon pressure/temperature conditions, material and wall thickness of the capsules, the walls of the capsules will be burned through, broken or otherwise destroyed or heated to a sufficient temperature and the powder D' therein will burn. The powder D' will burn after the shot or bullet has progressed a substantial distance through the gun barrel and will boost or maintain the pressure created on burning of the powder D, with the result that the velocity of the shot or bullet will be greatly accelerated.

As will be obvious, the capsules E or some of them may be made to break down respectively at intervals, if desired, by constructing them or some of them, respectively, of different materials relatively differently resistant to heat or pressure.

The use of various particular materials for forming the capsules E will be productive variously of particular advantage. Thus, where celluloid is used it will, on burning, supplement the charge, gelatin will act as a deterrent to slow up the speed of burning of the charge as a whole, while tin or tin alloys will act to prevent fouling of the gun barrel.

Practical adaptation of this invention has shown its advantage more particularly in obtaining higher velocities with a given pressure than heretofore with the same pressure.

Such is shown, for example, by the fact that a standard 30 06 Springfield rifle, firing cartridges loaded with smokeless powder (Hivel No. 2), and fitted with a 173 grain boat-tailed bullet, was found to give a muzzle velocity of 1638 feet per second and a breech pressure of 33,700 pounds per square inch, when containing a unit charge of 25.5 grains of the said smokeless powder. In comparison, a cartridge identical with the above, except for the fact that the powder charge, of the same quality of powder, comprised 21.2 grains of loose powder and 11.3 grains in a sealed copper capsule having a wall thickness of approximately .009 inch, or a total powder charge of 32.5 grains (which could be expected to give a much higher breech pressure if an undivided, loose charge), gave a velocity of 1862 feet per second and a breech pressure of only 32,100 pounds per square inch, i. e. a breech pressure even lower than the normal unit charge, but producing a substantially higher velocity than the normal unit charge.

As illustrative of practical adaptation of this invention to shot gun shells, for example, results from the standpoint of shot velocity and breech pressures using the same shell, cap, powder and shot charge as shown in the following table in comparison between a standard loading and loadings in accordance with this invention.

Smokeless powder charge	Shot velocity	Breech pressure
	Ft. per sec.	*Lbs.*
Standard—22.5 grains	926	10,600
Embodying the invention—30.5 grains (10.0 thereof being in gelatin capsules)	1,011	10,700
37.8 grains (13.32 thereof being in gelatin capsules)	1,019	9,200

From the above table it will be noted that the heavier powder charges of the loadings according to this invention as compared with powder charge of the standard loading produced higher velocity without the production of materially higher breech pressure in one case, and with the production of substantially lower breech pressure in the other case.

It will be appreciated that in practically embodying this invention numerous variations in

details may be made from the specific description above without departing from the scope of the invention.

What I claim and desire to protect by Letters Patent is:

1. A propellant charge for guns comprising a mass of explosive comprising a portion of the total charge and a container formed from an incombustible material embedded in said mass and containing an explosive comprising another portion of the total charge.

2. A propellant charge for guns comprising a mass of relatively slow burning smokeless powder comprising a portion of the total charge and a container loosely embedded in said mass of explosive and containing a relatively fast burning smokeless powder comprising another portion of the total charge.

3. A propellant charge for guns comprising a mass of explosive comprising a portion of the total charge and a container loosely embedded in said mass of explosive and containing a smokeless powder comprising another portion of the total charge, the smokeless powder comprised in said mass and contained in said capsule having, respectively, different burning rates.

4. A propellant charge for guns comprising a mass of smokeless powder comprising a portion of the total charge and an incombustible container embedded in said mass and containing a fast burning explosive comprising another portion of the total charge.

5. A propellant charge for guns comprising a mass of a smokeless powder treated with deterrent comprising a portion of the total charge and a container embedded in said mass and containing an untreated smokeless powder comprising another portion of the total charge.

6. A propellant charge for guns comprising a mass of explosive comprising a portion of the total charge, a container within said mass of explosive containing an explosive comprising another portion of the charge and a container within said first mentioned container and containing still another portion of said charge.

7. A propellant charge for guns comprising a mass of explosive comprising a portion of the total charge and a metallic container loosely embedded in said mass of explosive and containing an explosive comprising another portion of the charge.

8. In combination, a propellant charge for guns comprising a mass of explosive comprising a portion of the total charge and a container loosely embedded in said mass of explosive and containing an explosive comprising another portion of the total charge and means for firing the said mass of explosive, the said container being of a character such as to protect its contained charge from flame resultant from ignition of the said mass of explosive for a period after the ignition thereof by the igniting means therefor.

9. In combination, a propellant charge for guns comprising a mass of explosive comprising a portion of the total charge and a container containing an explosive comprising another portion of the total charge and means for firing the said mass of explosive, the said container being of a character such as to protect its contained charge from flame resultant from ignition of the said mass of explosive for a period after the ignition thereof by the igniting means therefor and of such a character as to conduct heat developed on burning of the said mass of explosive to its contained charge for the ignition thereof at a time subsequent to the ignition of the said mass of explosive.

10. A propellant charge for guns comprising a mass of explosive comprising a portion of the total charge and a container formed from a combustible material embedded wholly in said mass of explosive and containing an explosive comprising another portion of the total charge.

11. A propellant charge for guns comprising a mass of explosive comprising a portion of the total charge and a container formed from a combustible material embedded and freely movable within said mass of explosive and containing an explosive comprising another portion of the total charge.

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